
APPENDIX D – SOIL AND WATER QUALITY BEST MANAGEMENT PRACTICES

Water Quality Regulations and Beneficial Uses

The West Fork of Rock Creek has been classified as A-1 by the Montana Department of Environmental Quality. Waters under this classification “are to be maintained suitable for drinking, culinary, and food processing purposes after conventional treatment for removal of naturally present impurities. Water quality must be maintained suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.” (Administrative Rules of Montana (ARM 17.30.622)). With minor exception (as outlined in 75-5-318, MCA), increases in sediment or suspended sediment are prohibited.

All other streams within the project area have been classified as B-1 waters. Beneficial uses for these waters are identical to A-1 waters. As with A-1 classification standards, sediment and suspended sediment increases above naturally occurring concentrations are prohibited (see Surface Water Quality Standards below for further discussion). E. coli, turbidity, and true color standards for B-1 waters are less stringent than for A-1 waters.

The Montana Water Quality Act, Nondegradation Rules, and Surface Water Quality Standards require that land management activities must not generate pollutants in excess of those that are naturally occurring, regardless of the stream’s classification. Naturally occurring is defined as: “the water quality condition resulting from runoff or percolation over which man has no control or from developed lands where all reasonable land, soil and water conservation practices have been applied.” Note: Reasonable land, soil, and water conservation practices are commonly called Best Management Practices (BMPs). BMPs are considered reasonable only if beneficial uses are protected. They are further described in the Forest Service Handbook - Soil and Water Conservation Practices (FSH 2509.22). Please refer to the next section for a list and description of the BMPs that will be implemented under the alternatives.

Best Management Practices

Best Management Practices (BMPs) are the primary mechanism to achieve water quality standards. This Appendix describes the Forest Service’s BMP process in detail, lists the key Soil and Water Conservation Practices (comparable to BMPs) that have been selected to be used on this project, and describes each BMP that will be refined for site-specific conditions in order to arrive at the project level BMPs that protect beneficial uses and meet water quality objectives.

BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 CFR 130.2, EPA Water Quality Standards Regulation). Usually BMPs are applied as a system of practices rather than a single practice. BMPs are selected on the basis of site-specific conditions

that reflect natural background conditions and political, social, economical, and technical feasibility.

The Custer National Forest Plan, Management Standards (chapter II, page 25) states that the Forest will “protect, conserve, and enhance water consistent with other land and resource management plan objectives, through the use of improved technology, cooperative planning and application of BMP's. Water originating on National Forest System lands will meet State Water Quality Standards except where it cannot be improved due to natural geologic conditions.”

Montana State Water Quality Standards require the use of reasonable land, soil, and water conservation practices (analogous to BMPs and soil and water conservation practices) as the controlling mechanism for nonpoint pollution. Use of BMPs is also required in the Memorandum of Understanding between the Forest Service and the State of Montana as part of our responsibility as the Designated Water Quality Management Agency on National Forest System (NFS) lands.

The practices described herein are tiered to the practices in FSH 2509.22. They were developed as part of the National Environmental Policy Act (NEPA) process, with interdisciplinary involvement, and meet Forest and State water quality objectives.

ABBREVIATIONS:

TSC = Timber Sale Contract

SAM = Sale Area Map

TSA = Timber Sale Administrator

COR = Contracting Officer Representative

PWC = Public Works Contract

SWCP = Soil and Water Conservation Practices

BMP = Best Management Practice

SMZ = Streamside Management Zone

SPS = Special Project Specification

EPA = Environmental Protection Agency

CFR = Code of Federal Regulations

BMP IMPLEMENTATION PROCESS

In cooperation with the State, the USDA Forest Service's primary strategy for the control of nonpoint sources is based on the implementation of preventive practices (BMPs) determined necessary for the protection of the identified beneficial uses.

The Forest Service Nonpoint Source Management System consists of:

1. BMP selection and design based on site-specific conditions; technical, economical, and institutional feasibility; and the designated beneficial uses of the streams.
2. BMP Application.

3. BMP monitoring to insure that they are being implemented and are effective in protecting designated beneficial uses.
4. Evaluate BMP monitoring results from step 3.
5. Feedback the results into current/future activities and BMP design.

The District Ranger is responsible for insuring that this BMP feedback loop is implemented on all projects.

1. **BMP Selection and Design.** Water quality goals are identified in Forest Plans. These goals meet or exceed applicable legal requirements, including State water quality regulations, the Clean Water Act, and the National Forest Management Act. Environmental assessments for projects are tiered to Forest Plans, using the NEPA process.

Appropriate BMPs are selected for each project by an interdisciplinary team. Each time BMPs are applied to a new location, there is flexibility to design different BMPs depending on the local conditions and values, and the downstream beneficial uses of water.

BMP selection and design are dictated by water quality objectives, soils, topography, geology, vegetation, and climate. Environmental impacts and water quality protection options are evaluated and alternative mixes of practices are considered. A final collection of practices is selected that not only protect water quality but meet other resource needs. These final selected practices constitute the BMPs.

2. **BMP Application.** The BMPs are translated into contract clauses, special use permit requirements, project plan specifications, and so forth. This insures that the operator or person responsible for applying the BMP is actually required to apply it. The site-specific BMP prescriptions are taken from plan-to-ground by a combination of project layout and resource specialists (hydrology, fisheries, soil, geology, etc.). This occurs when final adjustments to fit the BMP prescriptions to the site are made before implementing the resource activity.

3. **BMP Monitoring.** When the resource activity (timber harvest or road construction) begins, timber sale administrators, engineering representatives, resource specialists, and others insure that the BMPs are implemented according to plan. BMP implementation monitoring is done before, during, and after resource activity implementation. This monitoring answers the question: Did the Forest Service do what it said it was going to do? Once BMPs have been implemented, further monitoring is done to evaluate if BMPs are effective in meeting management objectives and protecting beneficial uses of water. This is accomplished through BMP reviews. Monitoring is also conducted on streams, management activities, and BMPs outside the analysis area. Forest-wide and Statewide monitoring aid in determining the effectiveness of BMPs.

4. **BMP Monitoring Evaluation.** The technical evaluation/monitoring described above will determine how effectively BMPs protect and/or improve water quality. Water quality standards and conditions of the beneficial uses of water will serve as one-evaluation criteria. If the

evaluation indicates that water quality standards are not being met and/or beneficial uses are not being protected, corrective action will consider the following three components:

- a. Is the BMP technically sound? Is it really best, or is there a better practice, which is technically sound and feasible to implement?
- b. The implementation program or processes: Was the BMP applied entirely as designed? Was it only partially implemented? Were personnel, equipment, funds, or training lacking with a result of inadequate or incomplete implementation?
- c. The State water quality criteria: Do the parameters and criteria that constitute water quality standards adequately reflect human induced changes to water quality and beneficial uses?

5. Feedback. Feedback of the results of BMP evaluation is both short- and long-term in nature. Where corrective action is needed, immediate response will be undertaken. This action may include: modification of the BMP, modification of the activity, ceasing the activity or possibly modification of the State water quality standard. Cumulative effects over the long-term may also lead to the need for possible corrective actions.

FORMAT OF BEST MANAGEMENT PRACTICES

Each Soil and Water Conservation Practice (SWCP) is described as follows:

Title: Includes the sequential number of the SWCP and a brief title

Objective: Describes the SWCP objective(s) and the desired results for protecting water quality.

Effectiveness: Provides a qualitative assessment of expected effectiveness that the applied measure will have on preventing or reducing impacts on water quality. The SWCP effectiveness rating is based on literature and research, administrative studies, and professional experience. The SWCP is rated High, Moderate, or Low based on the following criteria:

1. Literature/Research (must be applicable to area)
2. Administrative studies (local or within similar ecosystem)
3. Experience (judgment of an expert by education and/or experience)
4. Fact (obvious by reasoned [logical] response)

Please see the section below on BMP monitoring results that have been documented for the Custer National Forest.

Implementation: This section identifies: 1) the range of site-specific water quality protection measures to be implemented, and 2) how the practices are expected to be applied.

BMP MONITORING

BMP monitoring is an important component of the implementation process. Past BMP monitoring on the Custer National Forest is as follows:

A Forest-level BMP audit was conducted on the Laka Breaks and Russell Timber Sales on June 24, 2009. Observations by IDT members and staff officers indicate that all BMPs were implemented as planned and were effective in reducing soil and water impacts. No departures in application or effectiveness were noted. One practice, SMZ marking, exceeded the BMP requirements as marking occurred on a Class III stream, normally not required under the SMZ regulations.

In September 2013, an internal implementation and effectiveness (I&E) review was completed for the Picket Pin Prescribed Burn project on the Beartooth District of the Custer National Forest. This process goes beyond field review of soil and water BMP implementation and efficacy by first completing an in-depth review of all design criteria and mitigations included in the NEPA decision in cooperation with involved resource specialists. Of the six project objectives, two had departure from complete application. As a result, those two objectives were rated as being less than fully met. While several evaluation factors were given a “1” application rating, in no instance was an evaluation factor given a “1” effectiveness rating. So, while some design criteria were not applied as intended, no significant resource impacts were sustained. Documentation of this review has yet to be finalized.

A Montana State BMP audit was conducted on the Lyon Creek Timber Sale on July 26, 2002. A total of 34 BMPs were evaluated, and departures on three practices were observed. These practices all involved sediment generation from existing or constructed roads, but delivery was to ephemeral draws, not perennial streams. Most of these problems could have been avoided by implementing effective revegetation practices, i.e., seeding.

According to The Montana 2008 Forestry BMP Audit Report (MT DNRC 2008), 96% of the BMP practices rated on Federal lands were effective in protecting soil and water resources, while 91% of the “high risk” BMP practices rated on Federal lands were effective. Audit results for the decade 2000 have improved considerably from the audits during the 1990’s for all aspects; application and effectiveness all practices, and for high-risk practices in particular (total of all ownerships).

Montana Interagency BMP field reviews on federal lands have documented appropriate application and effectiveness of pertinent BMPs 96% and 98% of the time, respectively, or better during the last two biennial review cycles. Stream Management Zone application and effectiveness has been met or exceeded 94 and 95 percent of the time, respectively. Since 1990, these field reviews have further documented reductions in BMP departures, number of sites with at least one major departure from proper BMP application, and number of sites with prolonged impacts across all ownerships (MT DNRC 2010; MT DNRC 2012).

In conclusion, given the high number of timber management activities, only a small percentage of BMPs are not implemented correctly and even smaller percentages are occasionally not

effective in protecting soil and water resources. Additional literature that supports the effectiveness of forestry BMPs can be found in Logan (2001), Seyedbagheri (1996), and USDA-FS (2002).

CLARIFICATION OF MONTANA FORESTRY BMPs, STREAMSIDE MANAGEMENT ZONE RULES AND SPA 124 STREAM PERMIT

Montana Forestry BMPs

Skid Trails and Temporary Roads

To ensure effective rehabilitation and long term stabilization of temporary roads, ensure road prisms are not passable by 4x4 vehicles. To the extent practical, place logging slash (cull logs, rootwads, large limbs) along the road prism, especially at points of entrance to the road. Rip overly compacted segments as needed, and seed prior to placing slash. Pull all culverts and restore crossing sites to match adjacent topography.

Maintenance of System Roads

Maintenance of some existing roads to allow suitable access for log trucks may result in new soil disturbance. Grading activities should ensure that adequate drainage and proper location of drainage features in relation to stream crossings is incorporated into the road template. There a number of Montana Forestry BMPs that pertain to this concern and close adherence should be given to the following three: III.C.1 – Provide adequate road surface drainage for all roads, III.C.7 – Route road drainage through adequate filtration zones before entering a stream, V.B.1.b – Direct road drainage away from stream crossing site. These three BMPs have continually resulted in departures during the State biennial BMP audit process over the last 16 years. Minor departures occur where road generated sediment is delivered to draws (dry, non-scoured drainage features), but not streams. Major departures occur where sediment is delivered to streams (not necessarily perennial) or annual floodplains. The quantity of sediment does not affect the departure rating (one shovel full same as one dump truck load), but the duration does (temporary or one season, versus prolonged or more than one season).

Prescribed Fire

Where practical, minimize high intensity fire within densely vegetated draws by allowing fire to back down into draws rather than allowing fire to build in intensity as it moves upslope through the draws. This would provide for minimal soil exposure, allow for rapid regeneration of ground cover, and maintain drainage bottom stability and resistance to high intensity rain events.

Streamside Management Zone Law and Rules

Proposed treatments may conflict with SMZ Rule 3, which prohibits broadcast burning in an SMZ. While no active lighting is proposed within SMZs, it is possible that prescribed fire in

adjacent units may burn into the SMZ. An Alternative Practices Waiver will be acquired prior to initiation of project activities.

Stream Permits

When locating and constructing temporary roads and skid trails, avoid crossing drainage bottoms below spring sources where wetland plant communities occur, or where intermittent or perennial stream courses exist. If crossings cannot be avoided, incorporate appropriate BMPs into the crossing design and ensure that appropriate permits are obtained prior to implementing the project, i.e., 124 permits from the Montana Department of Fish, Wildlife and Parks (MTDFWP). Permits generally require at least 30 days for processing applications prior to implementation.

KEY SOIL AND WATER CONSERVATION PRACTICE LIST

The following table displays the Soil and Water Conservation Practices (comparable to BMPs) required in Forest Service Handbook 2509.22. Note that not all the SWCPs are listed here--only those that require further specificity in the Environmental Impact Statement are listed. The Forest Service requires adherence to all practices outlined in the handbook. There are standard provisions for compliance in every timber sale contract for BMPs pertaining to timber harvesting (refer to FSM 2509.22 and Timber Sale Contract Provisions available in the Ranger District Office).

Table D.1: Soil and Water Conservation Practices

ID #	Soil and Water Conservation Practices Title
11 - WATERSHED MANAGEMENT	
11.05	Wetlands Analysis and Evaluation
11.07	Oil and Hazardous Substance Spill Contingency Planning
11.09	Management by Closure to Use
13 - VEGETATION MANIPULATION	
13.02	Slope Limitations for Tractor Operations
13.03	Tractor Operation Excluded from Wetlands, Bogs and Wet Meadows
13.04	Revegetation of Surface Disturbed Areas
13.06	Soil Moisture Limitations for Tractor Operation
14 - TIMBER	
14.02	Timber Harvest Unit Design
14.03	Use of Sale Area Maps for Designating Soil and Water Protection Needs
14.04	Limiting the Operating Period of Timber Sale Activities
14.05	Protection of Unstable Areas
14.06	Riparian Area Designation

ID #	Soil and Water Conservation Practices Title
14.07	Determining Tractor Loggable Ground
14.08	Tractor Skidding Design
14.09	Suspended Log Yarding in Timber Harvesting
14.1	Log Landing Location and Design
14.11	Log Landing Erosion Prevention and Control
14.12	Erosion Prevention and Control Measures During Timber Sale Operations
14.14	Revegetation of Areas Disturbed by Harvest Activities
14.15	Erosion Control on Skid Trails
14.16	Meadow Protection During Timber Harvesting
14.17	Stream Channel Protection
14.18	Erosion Control Structure Maintenance
14.19	Acceptance of Timber Sale Erosion Control Measures Before Sale Closure
14.2	Slash Treatment in Sensitive Areas
14.22	Modification of Timber Sale Contract
14.23	Reforestation Requirement
15 – ROADS AND TRAILS	
15.02	General Guidelines for Road Location/Design
15.03	Road and Trail Erosion Control Plan
15.04	Timing of Construction Activities
15.05	Slope Stabilization and Prevention of Mass Failures
15.06	Mitigation of Surface Erosion and Stabilization of Slopes
15.07	Control of Permanent Road Drainage
15.09	Timely Erosion Control Measures on Incomplete Road and Stream crossing Projects
15.1	Control of Road Construction Excavation and Sidecast Material
15.11	Servicing and Refueling of Equipment
15.12	Control of Construction in Riparian Areas
15.13	Controlling In-Channel Excavation
15.14	Diversion of Flows Around Construction Sites
15.15	Stream crossings on temporary Roads
15.16	Bridge and Culvert Installation
15.17	Regulation of Borrow Pits, Gravel Sources, and Quarries
15.18	Disposal of Right-of-Way and Roadside Debris
15.19	Streambank Protection
15.21	Maintenance of Roads

ID #	Soil and Water Conservation Practices Title
15.22	Road Surface Treatment to Prevent Loss of Materials
15.23	Traffic Control During Wet Periods
15.24	Snow Removal Controls
15.25	Obliteration of Temporary Roads
18 - FIRE SUPPRESSION AND FUELS MANAGEMENT	
18.02	Formulation of Fire Prescriptions
18.03	Protection of Soil and Water From Prescribed Burning Effects

SOIL AND WATER CONSERVATION PRACTICE DESCRIPTIONS

PRACTICE 11.05 - Wetlands Analysis and Evaluation

PRACTICE 13.03 - Tractor Operation Excluded from Wetlands, Bogs, and Wet Meadows

PRACTICE 14.16 - Meadow Protection During Timber Harvesting

OBJECTIVE: To maintain wetland functions and avoid adverse soil and water resource impacts associated with any disturbance of wetlands, bogs, and wet meadows.

EFFECTIVENESS: High

IMPLEMENTATION: When it is necessary to identify these areas on the sale area map, direction to do so and protective requirements will be incorporated into TSC provisions. Vehicular or skidding equipment shall not be used on meadows except where roads, landings, and tractor roads are approved. Unless otherwise agreed, trees felled into meadows shall be removed by end-lining, and resulting logging slash shall also be removed. Damage to meadows, stream courses, and riparian areas caused by unauthorized purchaser's operations shall be repaired by the purchaser in a timely manner to restore and prevent further damage.

PRACTICE 11.07 - Oil and Hazardous Substance Spill Contingency Planning

PRACTICE 15.11 - Servicing and Refueling of Equipment

OBJECTIVE: To prevent contamination of waters from accidental spills of fuels, lubricants, bitumens, raw sewage, wash water, and other harmful materials by prior planning and development of Spill Prevention Control and Countermeasure (SPCC) Plans.

EFFECTIVENESS: Although SPCC Plans cannot eliminate the risk of materials being spilled and escaping into waters, they can be effective at reducing adverse effects to tolerable levels. Depending on the location and quantity of a spill, a properly implemented plan can provide for up to 100% containment of a spill.

IMPLEMENTATION: TSC provisions holds the purchaser responsible for taking appropriate preventive measures to insure that any oil spill or oil products does not enter any stream or other waters of the United States. If the total oil or oil products storage exceeds 1,320 gallons or if any single container exceeds a capacity of 660 gallons, the purchaser will prepare a SPCC Plan. The plan shall meet Environmental Protection Agency requirements including certification by a registered professional engineer.

The Contracting Officer Representative will designate the location, size and allowable uses of service and refueling areas. The criteria below will be followed at a minimum:

1. Petroleum product storage containers with capacities of more than 200 gallons, stationary or mobile, will be located no closer than 100 feet from stream, watercourse, or area of open water. Dikes, berms, or embankments will be constructed to contain the volume of petroleum products stored within the tanks. Diked areas will be sufficiently impervious and of adequate capacity to contain spilled petroleum products.
2. Transferring petroleum products: During fueling operations or petroleum product transfer to other containers, there shall be a person attending such operations at all times.
3. Equipment used for transportation or storage of petroleum products shall be maintained in a leak-proof condition. If the Forest Service Representative determines there is evidence of petroleum product leakage or spillage he/she shall have the authority to suspend the further use of such equipment until the deficiency has been corrected.
4. For longer-term storage, a sump pond lined with plastic will be constructed equal to the volume of fuel stored on the site.

In the event any leakage or spillage enters any stream, water course or area of open water, the operator will immediately notify the Contracting Officer Representative (COR) who will be required to follow the actions to be taken in case of hazardous spill, as outlined in the Forest Hazardous Substance Spill Contingency Plan.

PRACTICE 11.09 - Management by Closure to Use

OBJECTIVE: To exclude activities that could result in damages to facilities or degradation of soil and water resources.

EFFECTIVENESS: High

IMPLEMENTATION: Specific guidelines for closure of roads during the period of the contract and at the end of the purchasers operations will be spelled out in the timber contract. Travel restrictions and area closures are spelled out under each alternative.

PRACTICE 13.02 - Slope Limitations for Tractor Operation
PRACTICE 14.07 - Determining Tractor Loggable Ground

OBJECTIVE: To reduce gully and sheet erosion and associated sediment production by restricting tractor operation to slopes where corrective measures for proper drainage are easily installed and effective.

EFFECTIVENESS: High. In general, the less the slope percentage, the less are the chances of rilling, gullyng, and soil displacement as a consequence of tracked or wheeled skidding.

IMPLEMENTATION: Tracked or wheel skidding shall not be conducted on slopes greater than 45%. When slope exceeds 35%, a constructed skid trail should be used to concentrate traffic on one route with a pitch of less than 20%.

PRACTICE 13.04 - Revegetation of Surface Disturbed Areas
PRACTICE 14.14 - Revegetation of Areas Disturbed by Harvest Activities

OBJECTIVE: To protect soil productivity and water quality by minimizing soil erosion.

EFFECTIVENESS: Revegetation can be moderately effective at reducing surface erosion after one growing season following disturbance and highly effective in later years. Effectiveness has been shown to vary from 10 percent on ¾:1 slopes to 36 percent on 1:1 slopes to 97 percent on 1:1 slopes in later years (King, John G. and E. Burroughs. Reduction of Soil Erosion on Forest Roads. Intermountain Research Station General Technical Report, 1989).

IMPLEMENTATION: All temporary roads, landings, and skid trails in the sale area will be seeded within one year after harvesting is completed. Approved seed mixes and fertilizer specifications will be incorporated into TSC provisions. TSC provisions will identify that scarification/ripping of compacted landings and closed roads will be a minimum of 6 inches, not to exceed 14 inches. This specification will be applied according to the following guidelines:

PRACTICE 13.05 - Soil Protection During and Following Slash Filter Windrowing

OBJECTIVE: To reduce erosion and sedimentation from road surfaces and fill slopes, slash is windrowed below the fill slope.

EFFECTIVENESS: High

IMPLEMENTATION: At a minimum, slash filter windrows will be installed 100 feet on both sides of all new stream crossings where sediment delivery from the fill slope can be expected. Slash filter windrows will also be implemented where erosion may deliver sediment to stream systems.

PRACTICE 13.06 - Soil Moisture Limitations for Tractor Operation

OBJECTIVE: To minimize soil compaction, puddling, rutting, and gullyng with resultant sediment production and loss of soil productivity by insuring that activities are done when ground conditions are such that erosion and sedimentation can be controlled.

EFFECTIVENESS: Responsible implementation and enforcement are required for high effectiveness.

IMPLEMENTATION: Tractor operations will be limited to periods when the soil moisture content is sufficiently so low that excessive rutting or other soil damage does not occur. In addition, filter cloth and fill material should be used when crossing wet areas rather than cut and fill operations.

PRACTICE 14.02 - Timber Harvest Unit Design; PRACTICE 14.08 - Tractor Skidding Design; PRACTICE 14.10 - Log Landing Location and Design

OBJECTIVE: To insure that timber harvest unit design will maintain water quality and soil productivity by locating/designing landings and skidding patterns to best fit the terrain and avoid soil erosion.

EFFECTIVENESS: Restricting tractor skidding to designated skid trails can reduce the aerial extent of soil disturbance from the typical 18 to 36% and to 10% or less. Properly located landings and skid trails produce similar results. Effectiveness is expected to be moderate

IMPLEMENTATION: TSC provisions require that the location of all skid trails and landings must be agreed upon before construction. Specific criteria that will be addressed during sale-layout and pre-work with the operator will include:

Skid Trails-

1. Ground based skidding equipment should travel off established skid trails only to the extent reasonably necessary to harvest available timber.
2. Use ground-based harvest systems only on slopes having sustained grades less than 35 percent. Require a systematic skid trail pattern during logging. Lay out skid trails in a manner that minimizes or eliminates sustained grades steeper than 15%. Maintain an average of at least 75 feet between skid trails in harvest units, except where skid trails converge.
3. Vehicles and logging machinery would not be driven within 50 feet of wetlands, with the exception of maintenance/reconstruction/decommissioning of existing roads and designated temporary crossings. SMZ regulations regarding tree retention would be extended to apply to isolated wetlands.

4. Regional soil quality guidelines require that management activities not create detrimental soil conditions on greater than 15 percent of the activity area. Any detrimental disturbance exceeding 15% in the activity area should be remediated after treatment. Detrimental soil disturbance includes any or all of the following (from FSM 2500 R1 Supplement 2500-99-1 2554.10):
 - a. Compaction resulting in a 15 percent increase in bulk density
 - b. Rutting in excess of 2 inches
 - c. Displacement of soil of one or more inches depth from a surface soil horizon from a continuous area greater than 100 square feet
 - d. Physical and biological changes to soil resulting from high severity burning
 - e. Severe surface erosion, evidenced by rills, gullying, and soil deposition
5. Retain down woody debris in treatment units to ensure future soil productivity and provide for wildlife habitat. See Table 2.4.

Landings-

1. Landings and log decks will not be located on riparian or wet areas.
6. Areas of concentrated soil disturbance such as landings and skid trails would be ripped/scarified where compaction exists and seeded with native species after harvest activities are complete- but prior to the following winter season. Erosion control and drainage measures will be applied as appropriate immediately following completion of unit harvest activities. Monitor for new noxious weed infestations.

PRACTICE 14.03 - Use of Sale Area Maps for Designating Soil and Water Protection Needs

OBJECTIVE: To delineate the location of protection areas and special treatment areas, to insure their recognition, proper consideration, and protection on the ground.

EFFECTIVENESS: High

IMPLEMENTATION: The following features will be designated on the sale area map:

1. Stream courses (perennial and ephemeral) to be protected. Streamside Management Zones (SMZs) will be marked on the ground as required in the Montana law. No regeneration harvest units or commercial thinning units have identified SMZs.
2. Wetlands and Riparian Areas (meadows, lakes, pot holes, etc.) to be protected.

3. Special treatment areas, including riparian areas with planned harvest where logging and site prep will differ from adjoining units as identified in TSC provisions. No regeneration harvest units or commercial thinning units have identified special treatment areas.

The purchaser and the Sale Administrator prior to harvesting will review these features on the ground.

PRACTICE 14.04 - Limiting the Operating Period of Timber Sale Activities;
PRACTICE 15.04 - Timing of Construction Activities

OBJECTIVE: To minimize soil erosion, sedimentation and soil productivity loss by insuring activities, including erosion control work, road maintenance, etc., are done: (1) within the time period specified in the TSC; or (2) when ground conditions are such that erosion and sedimentation can be prevented.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Within the sale area, the following specifications relating to operating periods have been identified and recommended:

1. Earthwork shall be postponed during wet periods if, as a result, erodible material would enter streams.
2. TSC provisions allow operations to occur outside Normal Operating Season subject to multiple requirements. The following requirements apply to operations outside the Normal Operating Season:
 - a. Drain dips will be built into skid trails and temporary roads at the time of construction, where feasible. Where drain dips are not feasible, or are not functioning, trails and temporary roads will be water barred and maintained as necessary and/or prior to any prolonged shutdown.
 - b. Temporary Roads will be seeded immediately following completion of use.
 - c. All surface erosion and stabilization activities will be placed prior to November 1 of each year.
3. The following requirements apply to winter operations:
 - a. Skid trails will be constructed with waterbars and/or drain dips, and allowed to freeze prior to skidding operations.
 - b. Prior to spring shutdown, slash and/or cull logs will be placed into skid trails to approximate waterbars.
 - c. All streams and channels within harvest units will be flagged or otherwise identified.

d. Operations will be discontinued if conditions change and activities are no longer operating on frozen or snow covered ground, the intent of winter logging.

PRACTICE 14.05 - Protection of Unstable Areas

PRACTICE 15.05 - Slope Stabilization and Prevention of Mass Failures

OBJECTIVE: To identify and protect unstable areas and to avoid triggering mass movements of the soil mantle and resultant erosion and sedimentation.

EFFECTIVENESS: Avoidance is the most effective measure on high-risk landforms. Risk assessment based on experience is essential. Effectiveness is expected to be moderate.

IMPLEMENTATION: Unstable areas will be avoided by project design within the sale area. The following are guidelines that will be followed:

1. Avoid road locations or timber harvesting on or adjacent to active landslides, slump blocks and other mass wasting processes.
2. To prevent landslides, fill material used in landing construction shall be free of loose stumps and excessive accumulations of slash. On slopes where side casting is necessary, landings shall be stabilized by use of seeding, compaction, riprapping, benching, mulching, or other suitable means.
3. If road construction is necessitated in an area of moderate instability, the embankment should be layer placed or as recommended by a geotechnical engineer.
4. Identify any opportunities to stabilize existing unstable areas or minimize the adverse impacts associated with the unstable areas.

PRACTICE 14.06 - Riparian Area Designation and Protection

OBJECTIVE: To minimize the adverse effects on riparian areas with prescriptions that manages nearby logging and related land disturbance activities.

EFFECTIVENESS: High

IMPLEMENTATION: Riparian areas will be clearly marked prior to ground disturbing activities. Riparian areas will be identified and located on the sale area map. Requirements for protection of these areas will also be in TSC provisions.

1. The following practices in SMZs will be prohibited, except where an Alternative Practices Waiver has been acquired from Montana DNRC:
 - a. Broadcast burning.
 - b. The operation of wheeled or tracked vehicles will be prohibited except on established roads.

- c. The forest practice of clear cutting.
 - d. The construction of roads except when necessary to cross a stream or wetland.
 - e. The handling, storage, application, or disposal of hazardous or toxic materials in a manner that pollutes streams, lakes, or wetlands or that may cause damage or injury to humans, land, animals, or plants.
 - f. The side-casting of road material into a stream, wetland, or watercourse.
 - g. The deposit of slash in streams or other water bodies.
 - h. Retention of trees in the SMZ will comply with the Montana SMZ law and rules.
2. No trees would be cut within 15 feet of the Ordinary High Water Mark along any perennial streams for the purpose of providing thermal regulation, maintaining streambank stability, and ensuring a future source of LWD recruitment. An exception to this criterion will be in locations where naturally occurring meadows have been colonized by conifers. The fisheries biologist or hydrologist will determine which meadow stream segments have sufficient stream bank stability and aquatic habitat to warrant an exception from the 15-foot no-cut buffer. An Alternative Practices waiver will be acquired where vegetation manipulation may result in deviation from SMZ guidelines for overstory retention.
 3. Fisheries or hydrology staff will assist with leave tree marking along the riparian corridor beyond the 15-foot buffer. Leave trees would be those that, if they fell perpendicular to the channel, the diameter of the fallen tree at the high water mark of the channel would be greater than 8 inches in diameter. The purpose is to protect those trees that when recruited to the channel, are most likely to provide well-anchored and stable LWD while allowing harvest of smaller diameter trees that contribute to high fuel loads.

PRACTICE 14.09 - Suspended Log Yarding in Timber Harvesting

OBJECTIVE: To protect the soil from excessive disturbance and accelerated erosion and to maintain the integrity of the Riparian Area and other sensitive watershed areas.

EFFECTIVENESS: The more suspended log yarding can be used, the less soil disturbance will result. Effectiveness is expected to be moderate

IMPLEMENTATION: TSC provisions require that areas requiring special yarding be identified on the SAM. Cable yarding (partial or full suspension) will be used on all areas identified for such logging on the SAM. Uphill cable yarding is preferred. Where downhill yarding is used, reasonable care shall be taken to lift the leading end of the log to minimize downhill movement of slash and soils.

PRACTICE 14.11 - Log Landing Erosion Prevention and Control; PRACTICE 14.12 - Erosion Prevention and Control During Timber Sale Operations; PRACTICE 14.15 - Erosion Control on Skid Trails.

OBJECTIVE: To protect water quality by minimizing erosion and subsequent sedimentation derived from log landings and skid trails.

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following criteria will be used in controlling erosion and restoring landings and skid trails so as to minimize erosion:

General-

1. Deposit waste material from construction or maintenance of landings, skid, and fire trails in geologically stabilized locations at least 100 feet outside of any SMZ.
2. Skid trails and landings will be seeded with a mix appropriate to site and climatic conditions.

Landings-

1. During period of use, landings will be maintained in such a manner that debris and sediment are not delivered to any streams.
2. Landings shall be reshaped as needed to facilitate drainage prior to fall and spring runoff. Landings shall be stabilized by establishing ground cover or by some other means within one year after harvesting is completed.
3. Landings will drain in a direction and manner that will minimize erosion and will preclude sediment delivery to any stream.
4. After landings have served the purchaser's purpose, the purchaser shall ditch or slope them to permit the water to drain and disperse.

Skid Trails-

1. Skid trails and fire trails shall be stabilized whenever they are subject to erosion, by waterbarring, cross draining, outsloping, scarifying, seeding, or other suitable means. This work shall be kept current to prevent erosion prior to fall and spring runoff.
2. Skid trails will be water-barred, using the cross-drain spacing guide from the R1-R4 Guide for Controlling Sediment From Secondary Logging Roads.

PRACTICE 14.17 - Stream Channel Protection (Implementation and Enforcement)

OBJECTIVES: (1) To protect the natural flow of streams; (2) to provide unobstructed passage of storm flows; (3) to reduce sediment and other pollutants from entering streams; and (4) to restore the natural course of any stream as soon as practicable if the stream is diverted as a result of timber management activities.

EFFECTIVENESS: High

IMPLEMENTATION: The following items will be incorporated into the TSC:

1. Location and method of stream crossings will be agreed upon prior to construction.
2. Purchaser shall repair all damage to a streamcourse if the purchaser is negligent in his/her operations, including damage to banks and channel, to an acceptable condition as agreed to by the certified sale administrator and purchaser's representative.
3. All project debris shall be removed from streamcourse in an agreed upon manner that will cause the least disturbance.
4. Wheeled or tracked equipment shall not operate within 50 feet (100 feet where law requires it) slope distance of the apparent high water mark of streamcourses designated for protection on the sale area map.
5. When ground skidding systems are employed, logs will be end-lined out of streamside and Riparian Areas. Equipment is permitted to enter streamside areas only at locations and times agreed to by the certified sale administrator and the purchaser and only after Alternative Practice Approval are granted by the Montana Department of Natural Resources and Conservation, per the Montana SMZ law.
6. Material from temporary road and skid trail stream crossings will be removed and streambanks restored to an acceptable condition.
7. A Montana Stream Protection Act (SPA, FWP-124) permit will be obtained in advance where the bed or bank of the stream will be affected.

PRACTICE 14.18 - Erosion Control Structure Maintenance

OBJECTIVE: To insure that constructed erosion control structures are stabilized and working effectively.

EFFECTIVENESS: High

IMPLEMENTATION: Timber sale contract provisions require that during the period of the contract, the purchaser shall provide maintenance of soil erosion control structures constructed by the purchaser until they become stabilized, but not for more than one year after their construction. After one year, any erosion control work needed is accomplished through performance bond earmarked for that use. Timber sale contract provisions require the purchaser to maintain erosion control structures concurrently with his/her operations under the sale and in any case not later than 15 days after completion of skidding each unit.

PRACTICE 14.19 - Acceptance of Timber Sale Erosion Control Measures Before Sale Closure

OBJECTIVE: To assure the adequacy of required timber sale erosion control work.

EFFECTIVENESS: High

IMPLEMENTATION AND RESPONSIBILITY: Timber sale contract provisions require that upon the purchaser's written request and assurance that work has been completed the Forest Service shall perform an inspection. One area the purchaser's might request acceptance for is specific requirements such as logging, slash disposal, erosion control, or snag felling. In evaluating acceptance the following definition will be used by the Forest Service: "Acceptable" erosion control means only minor deviation from established standards, provided no major or lasting impact is caused to soil and water resources. Certified Timber Sale Administrators will not accept, as complete erosion control, measures, which fail to meet these criteria.

PRACTICE 14.20 - Slash Treatment in Sensitive Areas

OBJECTIVE: To protect water quality by protecting sensitive tributary areas from degradation that would result from using mechanized equipment for slash disposal.

EFFECTIVENESS: Moderate

IMPLEMENTATION: All such sensitive areas, including riparian harvest areas, bogs and meadows will be identified on the sale area map, the slash treatment map, and in the contract. The timber sale contract will include the following:

1. Pile burning within Streamside Management Zones will be utilized rather than broadcast burning.
2. Grapple piling of slash will be used in all machine pile units.

PRACTICE 14.22 - Modification of the Timber Sale Contract

OBJECTIVE: To modify the Timber Sale Contract if new circumstances or conditions indicate that the timber sale will cause irreversible damage to soil, water, or watershed values.

EFFECTIVENESS: High

IMPLEMENTATION: Over time, the Forest Service adopts new policies and direction that amend how we address timber harvest operations. An example is the recent change in direction to leave some large organic debris in stream channels instead of removing it all.

If evidence indicates that unacceptable impacts would occur to soil and water resources, when the sale was harvested as planned, the Forest Service Representative will request the Contracting Officer to gain Regional Forester advice and approval to proceed with a resource environmental modification, mutual cancellation, or unilateral cancellation of the timber sale contract. If the decision is for a resource environmental modification, once the Regional Forester approves the action, the appropriate Line Officer will assign an interdisciplinary team to make recommendations for implementation.

PRACTICE 14.23 - Reforestation Requirement

OBJECTIVE: To promote prompt reforestation and to limit disturbance on areas with limited regeneration potential.

EFFECTIVENESS: High

IMPLEMENTATION: All areas projected for regeneration harvest have been reviewed for silvicultural opportunities and have been certified that regeneration within five years is achievable. Project KV Plans will include funding for surveys as well as planting and site prep if necessary.

PRACTICE 15.02 - General Guidelines for the Location and Design of Roads and Trails

OBJECTIVE: To locate and design roads and trails with minimal soil and water resource impact while considering all design criteria.

EFFECTIVENESS:

1. Route location ground-truths the results of transportation planning and provides site-specific information on possible problem areas (Gray and Megahan 1981; Megahan and Kidd 1972; King and Gonsior 1980).
2. Designed and controlled cut slopes, fill slopes, road width, and road grades effectively reduce sediment production by fitting the roads to the land (King 1979; Megahan 1978).

IMPLEMENTATION: The following listed items are incorporated in general road location and design guidelines for minimizing impacts on water quality:

Design-

1. Roads shall be planned no wider than necessary to safely accommodate the anticipated use and equipment needs. Cut and fill volumes shall be minimized by designing the road to fit natural terrain features as closely as possible. As much of the excavated material as possible shall be used in fill sections. Minimum cuts and fills shall be planned, particularly near stream channels.

Location-

1. Utilize natural benches, follow contours, avoid long, steep road grades. Balance cut/fill where possible to avoid waste areas.
2. Embankments and waste shall be designed so that excavated material may be disposed of on geologically stable sites.

3. Avoid slumps and slide-prone areas, and steep sidehills.
4. Road construction shall be minimized within stream protection zones. Areas of vegetation shall be left or re-established between roads and streams [Standard Road Specifications-Special Project Specification 204.01].
5. Where possible, locate turn-outs and turn-arounds at least 200 feet from water bodies or riparian zones. Where placement within 200 feet is necessary due to safety considerations, emphasize erosion control measures to protect water quality; i.e., additional windrowing, seeding, etc.

Road Drainage-

1. Locate and design roads and trails to drain naturally by appropriate use of out-sloping, rolling dips, and grade changes, where possible. Dips, water bars and/or cross drainage will be planned when necessary. Cross drains will be installed in ditched areas to 1) carry intercepted flow across constructed areas; 2) to relieve the length of undrained ditch; and 3) to reduce disruption of normal drainage patterns. Road and trail drainage should be channeled to effective buffer areas, either natural or synthetic, to maximize sediment deposition prior to entry into live water.
2. Ditch lines and road grades will be designed to minimize unfiltered flow into streams. A rolling dip, relief culvert, or similar structure will be installed as close as practical to crossings to minimize direct sediment and/or water input directly into streams. Route the drainage through SMZ, buffer strips, or sediment settling structures where possible.
3. Relief culverts and roadside ditches shall be planned whenever reliance upon natural drainage would not protect the running surface, excavation, or embankment. Culvert installations shall be designed to prevent erosion of the fill. Drainage structures shall be planned to achieve minimum direct discharge of sediment into streams.

PRACTICE 15.03 - Road and Trail Erosion Control Plan

OBJECTIVE: To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction and maintenance activities through effective contract administration during construction and timely implementation of erosion control practices.

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following erosion control objectives and mitigation measures have been developed by the Interdisciplinary Team and will be reflected in contract specifications and provisions. The Engineer will certify that the Contractors Erosion Control Plan meets the specifications of Standard FS Specification Section 204:

1. Vegetation will be re-established as soon as possible on exposed cut and fill slopes. Various operating seasons on varied units and sales within the analysis area will require seeding and fertilization specs to vary. Mulching will be required on erodible slopes where difficulty in re-establishing vegetation is anticipated.
2. Prompt attention to potential erosion problems, both anticipated and un-anticipated, before they become a water quality issue, will be required. On-site stock piling of straw bales for immediate availability and erosion cloth or a suitable substitute stored off-site, but available, will also be required.
3. Windrows will be used on all significant fill slopes where there is a possibility of erosion or sedimentation into a nearby stream or channel (Std. FS Spec. 201).
4. Cross drains and relief culverts will be installed so as to minimize effects from the intercepted water (see also Practice 15.02 f. (3)).
5. Equipment shall not be operated when ground conditions are such that excessive ground impacts will occur unless these impacts are documented and mitigated through other BMPs.

Prior to the start of construction, the Contractor shall submit a schedule for proposed erosion control work as required in the Standard Specifications. The schedule shall include all erosion control items identified in the specifications. Erosion control work to be done by the Contractor will be defined in Standard Specification 204 and/or in the Drawings. The schedule shall consider erosion control work necessary for all phases of the project. The Contractor's construction schedule and plan of operation will be reviewed in conjunction with the erosion control plan to insure their compatibility before any schedules are approved.

PRACTICE 15.06 - Mitigation of Surface Erosion and Stabilization of Slopes

OBJECTIVE: To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction and to minimize erosion from road cutslopes, fillslopes, and travelways during and after construction.

EFFECTIVENESS: Seeding and fertilizing cut slopes, fill slopes, and other disturbed areas reduces erosion from these sources after one growing season. Effectiveness has been rated at 85% or better once the vegetation has become established (Burroughs and King 1989).

IMPLEMENTATION: Areas requiring mitigation of surface erosion will occur during the life of the contracts. When these are found, the following provisions will be implemented:

1. Where surface erosion is occurring because of inadequate vegetative cover, additional seeding and re-fertilization will occur using recommended seed and fertilizer mixes. A T108 spec covers reseeding of cut slopes, if bared by the purchaser's maintenance operation. If the purchaser has done his/her required seeding, or the purchaser does not cause bare spots, revise the KV Plan to cover costs.

2. Where ditches are carrying sediment into stream channels, straw bale and/or erosion cloth ditch blocks will be installed to induce deposition. Seeding of the eroding surfaces, and seeding of the stored sediment in the ditch will also be accomplished.
3. Where straw bale/erosion cloth structures either fail or effectiveness is doubtful, additional relief culverts will be installed to drain the ditches out onto suitable ground to at least minimize delivery of erosion products to the stream.
4. Slumping of cutslopes may require a combination of both mechanical and vegetative controls. If/when this problem is found, a solution will be determined in consultation with the engineers and the soil scientist.

Unless caused by the purchaser during his/her maintenance operations or known before sale award, or are part of a recurrent slide area these items will be beyond the scope of purchaser responsibility. Repair and/or improvement will be handled under reconstruction modified into the contract.

PRACTICE 15.07 - Control of Permanent Road Drainage

OBJECTIVE: To minimize the erosive effects of concentrated water and the degradation of water quality by proper design and construction of road drainage systems and drainage control structures.

EFFECTIVENESS: Designed and controlled ditches, cross drain spacing, and culvert discharge prevent water from running long distances over exposed ground. Dewatered (dry) culvert installations and special drainage such as rock filter blankets and rock buttresses have been demonstrated to be effective. Moderate

IMPLEMENTATION: The following items will be included in the timber sale contract provisions or road contract special project specifications.

All roads-

1. Drainage ways shall be cleared of all debris generated during construction and/or maintenance, which potentially interferes with drainage or water quality.
2. During and following operations on out-sloped roads, out-slope drainage shall be retained and berms shall be removed on the outside edge except those intentionally constructed for protection of road grade fills.
3. Cross drains and relief culverts will be installed so as to minimize concentrations of intercepted water (see also Practice 15.02 f. (3)).

New Road Construction- the following criteria will be incorporated into new road design:

1. Provide adequate drainage from the surface of all permanent and temporary roads through use of sloping, dips, grade changes, etc.
2. Ditch relief culverts will be designed to handle anticipated ditch flow.
3. Provide energy dissipaters or downspouts where necessary at the downstream end of ditch relief culverts to reduce erosion energy of the emerging water.

Existing Roads- at a minimum, the following items will be added to or improved in the existing road system that will be used for proposed timber haul:

1. Rock energy dissipaters or downspouts will be placed below problem culvert outlets (Reconstruction Item).
2. In all areas where ditch erosion is significant at this time, relief culverts that drain onto suitable areas will be installed (Reconstruction Item).
3. Roads restricted after use will also have erosion control measures in place prior to final pull-out.
4. For all native surface roads to be closed, the travelway will be scarified, seeded and fertilized.

PRACTICE 15.08 - Pioneer Road Construction

OBJECTIVE: To minimize sediment production and mass wasting associated with pioneer road construction.

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following contract specifications will be required:

1. Construction of pioneer roads shall be confined to the roadway limits unless otherwise approved by the Contracting Officer (Std. FS Spec. 203.11).
2. Pioneering shall be conducted so as to prevent undercutting of the designated final cut slope, and to prevent avoidable deposition of materials outside the designated roadway limits (Std. FS Spec. 203).
3. Erosion control work will be completed concurrent with construction activity or prior to the wet season. During the wet and winter season, no more than 1,000 feet of road can be in the pioneer state without the required erosion control work at any time (Std. FS Spec. 204).

4. Permanent culverts will be installed during the pioneer phase unless positive control of sediment can be accomplished during installation, use, and removal of the temporary structure.

PRACTICE 15.09 - Timely Erosion Control Measures on Incomplete Road and Streamcrossing Projects

OBJECTIVE: To minimize erosion of and sedimentation from disturbed ground on incomplete projects.

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following preventive measures will be implemented during projects:

1. The removal of temporary culverts, culvert plugs, diversion dams, or elevated streamcrossing causeways;
2. The installation of temporary culverts, side drains, flumes, cross drains, diversion ditches, energy dissipaters, dips, sediment basins, berms, debris racks, or other facilities needed to control erosion;
3. The removal of debris, obstructions, and spoil material from channels and floodplains;
4. Grass seeding, planting deep-rooted vegetation and/or mulching.

Erosion control measures must be kept current with ground disturbance, to the extent that the affected area can be rapidly “closed,” if weather conditions deteriorate. Areas must not be abandoned for the winter with remedial measures incomplete.

PRACTICE 15.10 - Control of Road Construction Excavation and Sidecast Material PRACTICE 15.18 - Disposal of Right-of-Way and Roadside Debris

OBJECTIVE: To insure that unconsolidated excavated and sidecast material, construction slash, and roadside debris, generated during road construction, is kept out of streams and to prevent slash and debris from subsequently obstructing channels.

EFFECTIVENESS: High

IMPLEMENTATION: Construction debris and other newly generated slash developed along roads near streams shall be disposed of by the following means as applicable (Std. FS Spec. 210, and SPS 201):

1. On-Site by windrowing, scattering, burying, chipping, disposal in cutting units, piling and burning, or embankment placement.

2. Removal to agreed upon locations.
3. A combination of the above.

In the construction of road fills near streams, compact the material to reduce the entry of water and minimize the amount of snow, ice, or frozen soil buried in the embankment. No significant amount of woody material shall be incorporated into fills. Slash and debris may be windrowed along the toe of the fill, but in such a manner as to avoid entry into a stream and culvert blockage.

Where slash windrows are not desirable or practical, other methods of erosion control such as erosion matts, mulch, and straw bale or fabric sediment fences will be used. Where exposed material (excavation, embankment, borrow pits, waste piles, etc.) is potentially erodible, and where sediments would enter streams, the material will be stabilized prior to fall or spring runoff by seeding, compacting, rip-rapping, benching, mulching or other suitable means. The following standard specs will be included in all road contracts, which include clearing and excavation.

1. Standard Specification 201 (Slash Treatment)
2. Standard Specification 203 (Excavation and Embankments)

PRACTICE 15.12 - Control of Construction in Riparian Areas

PRACTICE 15.13 - Controlling In-Channel Excavation

OBJECTIVE: To minimize stream channel disturbances and related sediment production, and to make sure activities comply with the SPA (124) permit process as agreed upon between the Forest Service and the State of Montana.

EFFECTIVENESS: High

IMPLEMENTATION: Construction equipment may cross, operate in, or operate near streamcourses only where so designated by the Forest Service or as necessary in the construction or removal of culverts and bridges. This will be done in compliance with the specifications and mitigation required in the SPA (124) permit and included in the project specifications.

Unless otherwise approved, no in-channel excavation shall be made outside of de-watered areas, and the natural streambed adjacent to the structure shall not be disturbed without approval of the Engineer. If any excavation or dredging is made at the site of the structure before caissons, cribs, or cofferdams are sunk in place, all such excavations will be restored to the original ground surface or the streambed will be protected with suitable stable material. Material from foundation or other excavation shall not be discharged directly into live streams but shall be pumped to settling areas shown on the drawings or approved by the Engineer. If the channel is damaged during construction, it should be restored as nearly as possible to its original configuration without causing additional damage to the channel. Excavations for stream crossings will conform to the SPA (124) permit criteria, including timing restrictions (as well as Std. FS Spec 206, 206A, and applicable Special Project Specifications).

PRACTICE 15.14 - Diversion of Flows Around Construction Sites

OBJECTIVE: To minimize downstream sedimentation by insuring that all stream diversions are carefully planned and executed.

EFFECTIVENESS: High

IMPLEMENTATION: Flow in stream courses may only be diverted if the Forest Service deems it necessary for the contractor to do the job. Such a diverted flow shall be restored to the natural stream course as soon as practicable and, in any event, within the period stated in the SPA (124) permit. Stream channels impacted by construction activity will be restored to their natural grade, condition, and alignment. The SPA (124) permit will be filed as specified in Practice 15.13 (Std. FS Spec. 206, 206A, and applicable Special Project Specifications).

PRACTICE 15.15 - Stream Crossings on Temporary Roads

OBJECTIVE: To keep temporary roads from unduly damaging streams, disturbing channels, or obstructing fish passage.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Culverts, temporary bridges, low-water crossings, or rock-lined fords will be required on all temporary roads and crossings. Streams that will have flowing water during the life of the temporary crossing will normally use culverts or a bridge. The number of temporary crossings will be kept to the minimum needed for access.

1. Temporary crossings on temporary roads will be removed when no longer needed, and any fills will be removed and the channel restored to pre-project condition. A SPA (124) permit will also be required.
2. Temporary crossings on system roads will be removed following use but protected fills, including constructed abutments, may remain.
3. All temporary stream crossings will be constructed to minimize sediment delivery to stream channels, convey high flows, and maintain passage of aquatic organisms.
4. Any topsoil removed during construction will be stockpiled for rehab purposes outside of the perennial floodplain (inundated by 1.5 – 2 year recurrence interval events) from the stream to prevent potential for sediment delivery.
5. All temporary crossings will be rehabilitated immediately upon project completion. Crossing rehab will include reconstructing crossings to match upstream and downstream streambed material and channel dimensions. Disturbed areas will be rehabilitated by applying any stockpiled topsoil and forest duff as well as a Forest-approved seed mix.
6. All stream crossing work would occur between July 15th and September 30st to minimize impacts to spawning fish and incubating eggs and fry. Work outside these timeframes could occur if the Forest fish biologist or hydrologist determines there would be minimal impact to fish.
7. Where site conditions permit, rock-lined fords may be used as an alternative to culverts. Crossing type will be prescribed and designed in coordination with hydrology or fisheries staff.

PRACTICE 15.16 - Bridge and Culvert Installation (Disposition of Surplus Material and Protection of Fisheries)

OBJECTIVE: To minimize sedimentation and turbidity resulting from excavation for in-channel structures.

EFFECTIVENESS: High

IMPLEMENTATION: The following preventive measures will be included in contract specifications for such installations:

1. Diverting stream flow through or around project sites if needed during construction in order to minimize erosion and downstream sedimentation. Active streams will be de-watered or diverted during culvert installations.
2. Erodeable material shall not be deposited into live streams.
3. During excavation in or near the stream course, it may be necessary to use suitable coffer dams, caissons, cribs or sheet piling. This will usually be the case where groundwater is contributing a significant amount of water to the immediate excavation area. If any of the aforementioned devices are used, they will be practically watertight and no excavation will be made immediately outside of them.
4. Water pumped from foundation excavation shall not be discharged directly into live streams, but shall be pumped into settling ponds or into locations where water will not re-enter water.
5. All fill material shall be placed and compacted in horizontal lifts. Areas to be filled shall be cleared of all vegetation, debris, and other materials that would be objectionable in the fill [SCPA Rule 9,1(d) and Standard Road Specifications-Special Project Specification 203.15].

PRACTICE 15.17 - Regulation of Borrow Pits, Gravel Sources, and Quarries

OBJECTIVE: To minimize sediment production from borrow pits, gravel sources, and quarries, and limit channel disturbances in those gravel sources suitable for development in floodplains.

EFFECTIVENESS: High

IMPLEMENTATION: Minimize opportunities for erosion from borrow pits and gravel sources to enter streams by implementing the following practices:

1. Complete any crushing and/or screening of excavated bedload away from any active stream channels and minimize future opportunities for waste materials to enter area streams, even under flood conditions.
2. Identify opportunities to minimize erosion from existing borrow pits within the drainage.

3. If development of new rock sources are needed within the watershed, complete a pit development plan or rock source development plan which outlines all mitigation measures needed to control future erosion at the rock source.

PRACTICE 15.19 - Streambank Protection

OBJECTIVE: To minimize sediment production from streambanks and structural abutments in natural waterways.

EFFECTIVENESS: Moderate

IMPLEMENTATION: To reduce sediment and channel bank degradation at sites disturbed by construction of stream crossing or roadway fill, it may be necessary to incorporate “armoring” in the design of a structure to allow the water course to stabilize after construction. Riprap, gabion structures, and other measures are commonly used to armor stream banks and drainage ways from the erosive forces of flowing water. These measures must be sized and installed in such a way that they effectively resist erosive water velocities. Stone used for riprap should be free from weakly structured rock, soil, organic material and materials of insufficient size, all of which are not resistant to stream flow and would only serve as sediment sources. Outlets for drainage facilities in erodible soils commonly require riprapping for energy dissipation (FSH 7709.56B, and Std. FS Spec. 619).

PRACTICE 15.21 - Maintenance of Roads

OBJECTIVE: To maintain all roads in a manner which provides for soil and water resource protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities.

EFFECTIVENESS: Moderate

IMPLEMENTATION:

1. For roads in active timber sale areas standard contract provisions require the purchaser to perform or pay for road maintenance work commensurate with the purchasers use. Road maintenance is the preservation of the road facility including surface, shoulders, miscellaneous structures, drainage, sight distance, and all such traffic control devices required to insure safe and efficient use by established road users and adequately protect adjacent resources. Purchaser’s maintenance responsibility shall cover the before, during, and after operation period during any year when operations and road use are performed under the terms of the timber sale contract.

Purchaser shall perform road maintenance work, commensurate with purchaser’s use, on roads controlled by Forest Service and used by purchaser in connection with this sale except for those roads and/or maintenance activities which are identified for required deposits in C5.411# and C5.412#.

All maintenance work shall be done currently, as necessary, in accordance with T-specifications, except for agreed adjustments.

2. For roads not in an active timber sale area, road maintenance must still occur at sufficient frequency to protect the investment in the road as well as prevent deterioration of the drainage structure function. This will be accomplished by scheduling periodic inspection and maintenance, including cleaning dips and cross drains, repairing ditches, marking culvert inlets to aid in location, and cleaning debris from ditches and culvert inlets to provide full function during peak runoff events (FSH 7709.15).

PRACTICE 15.22 - Road Surface Treatment to Prevent Loss of Materials

OBJECTIVE: To minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production.

EFFECTIVENESS: Stabilization of road surface and ditch lines over 6% with competent rock (rock that does not rapidly disintegrate) is often over 90% effective. High

IMPLEMENTATION: On timber sale roads, the purchaser shall undertake measures to prevent excessive loss of road material if the need for such action has been identified. Road surface treatments may include: watering, applying magnesium chloride, or aggregate surfacing.

PRACTICE 15.23 - Traffic Control During Wet Periods

OBJECTIVE: To reduce the potential for road surface disturbance during wet weather and to reduce subsequent sediment delivery to streams.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Haul restrictions are placed on asphalt-surfaced roads, based on interpretation of thermistor data. Restrictions are placed on native and aggregate-surfaced roads when a Forest Service representative feels that damage will occur with further use. Roads that are restricted are so indicated in Forest Supervisor Orders, posted at Forest Service Stations and in local media.

PRACTICE 15.24 - Snow Removal Controls

OBJECTIVE: To minimize the impact of snow melt on road surfaces and embankments and to reduce the probability of sediment production resulting from snow removal operations.

EFFECTIVENESS: Moderate

IMPLEMENTATION: For Forest roads that will be used throughout the winter, the following measures will be employed:

1. The purchaser is responsible for snow removal in a manner, which will protect roads and adjacent resources.
2. Rocking or other special surfacing and/or drainage measures may be necessary, before the operator is allowed to use the roads.
3. During snow removal operations, banks shall not be undercut nor shall gravel or other selected surfacing material be bladed off the roadway surface. Ditches and culverts shall be kept functional during and following roadway use. If the road surface is damaged, the purchaser shall replace lost surface material with similar quality material and repair structures damaged in blading operations.
4. Snow berms shall not be left on the road surface or shall be placed to avoid channelization or concentration of melt water on the road or erosive slopes. Berms left on the shoulder of the road shall be removed and/or drainage holes opened at the end of winter operations and before the spring breakup. Drainage holes shall be spaced as required to obtain satisfactory surface drainage without discharge on erodible fills. On insloped roads, drainage holes shall also be provided on the ditch side, but care taken to insure that culverts and culvert inlets are not damaged.

PRACTICE 15.25 - Obliteration of Temporary Roads

OBJECTIVE: To reduce sediment generated from temporary roads by obliterating them at the completion of their intended use.

EFFECTIVENESS: High

IMPLEMENTATION: Effective obliteration is generally achieved through a combination of the following measures:

1. Road effectively drained and blocked.
2. Temporary culverts and bridges removed and any modified channel slopes stabilized and revegetated.
3. Road returned to resource production through revegetation (grass, browse, or trees).
4. Sideslopes reshaped and stabilized.

PRACTICE 18.02 - Formulation of Fire Prescriptions

OBJECTIVE: To provide for soil and water resource protection while achieving the management objective through the use of prescribed fire.

EFFECTIVENESS: High

IMPLEMENTATION: the interdisciplinary team defines the prescription elements during the environmental analysis. Field investigations are conducted to identify site-specific conditions, which may affect the prescription. Both the optimum and tolerable limits for soil and water resource needs should be established. Prescription elements will include such factors as fire weather, slope aspect, soil moisture, and fuel moisture, which influence the fire intensity. These elements have a direct effect on whether or not a litter layer remains after burning and whether or not a water repellent layer is formed. The amount of remaining litter significantly affects erosion rates, water quality and runoff volumes.

PRACTICE 18.03 - Protection of Soil and Water from Prescribed Burning

OBJECTIVE: To maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients, and debris from entering surface water.

EFFECTIVENESS: High

IMPLEMENTATION: Forest Service and/or other crews are used to prepare the units for burning. This includes water barring firelines and reducing fuel concentrations. The interdisciplinary team identifies riparian areas and soils with water repellent tendencies as part of the environmental analysis. Some of the techniques used to prevent soil erosion and water quality degradation are: (1) construct waterbars in firelines; (2) reduce fuel loadings in drainage channels; (3) maintain the integrity of the riparian area; (4) avoid intense fires, which may promote water repellency, nutrient leaching, and erosion; (5) retain or plan for sufficient ground cover to prevent erosion of the burned sites; and (6) removal of all debris added to stream channels as a result of prescribed burning, unless debris is prescribed to improve fisheries habitat.